इंटरनेट मानक

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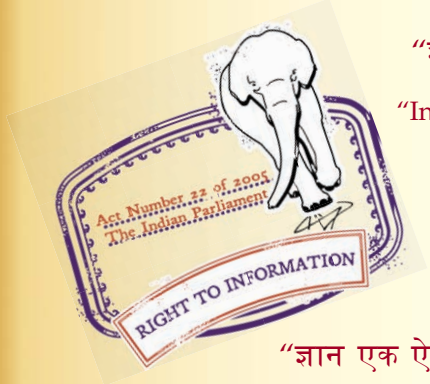
IS 3181 (1992): Conveyor belts - Fire resistant conveyor belting for underground mines and such other hazardous applications [PGD 31: Bolts, Nuts and Fasteners Accessories]



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Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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भारतीय मानक

वाहक पट्टा — भूमिगत खानों तथा ऐसे ही अन्य जोखिम वाले अनुप्रयोगों के लिये अग्निप्रतिरोधक वाहक पट्टा — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

CONVEYOR BELTS — FIRE RESISTANT CONVEYOR BELTING FQR UNDERGROUND MINES AND SUCH OTHER HAZARDOUS APPLICATIONS—SPECIFICATION

(Second Revision)

UDC 621·867·2 : 539·434 : 622·647·2

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 1992

Price Group 9

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Pulleys and Belts Sectional Committee had been approved by the Light Mechanical Engineering Division Council.

This standard was originally published in 1966 soon after indigenous manufacture of PVC underground Colliery Conveyor belting was started in India. It was done based upon contemporary specification of the National Coal Board, UK.

A revision was issued in 1978 primarily to convert all values into SI units and also include some new ranges of width dimensions. There were minor modifications in tensile strength, tear strength, etc.

In the last 20 years or more since the manufacture of PVC Underground Colliery Conveyor belting was started in India, substantial improvements and upgradation have taken place in the UK leading to a far better type of conveyor belting with 100 percent assurance on safety relating to fire hazards.

The current revision apart from rationalising a few aspects of the standard has been restructured to include the latest method for fire resistance namely Propane Gallery Test. This is a fire propagation test and going to be of immense value to the end user particularly in most hazardous gassy applications. This revision also includes modifications of the drum friction test equipment to give more accurate measurement of the temperature of the drum surface. Experience using the new testing apparatus for laid down in this standard has shown that consistently higher temperatures have been recorded than those obtained using the apparatus laid down in earlier version of the standard. In view of this, the specified maximum drum surface temperature has been raised, but it does not reduce the severity of test.

In preparation of this standard considerable assistance has been derived from the following:

ISO 252 : 1988 Conveyor betls — Ply adhesion between constitutive elements — Test method and requirements. International Organization for Standardization.

ISO 282 : 1975 Conveyor belts — Sampling. International Organization for Standardization.

ISO 284 : 1982 Conveyor belts — Electrical conductivity — Specification and method of test. International Organization for Standardization.

ISO 432 : 1989 Ply type conveyor belts — Characteristics of construction. International Organization for Standardization.

ISO 505 : 1982 Conveyor belts — Tear propagation resistance of the carcass — Method of test. International Organization for Standardization.

NCB Specification No. 158 — 1980 (and amended in 1985) Fire resistant conveyor belting. National Coal Board, UK.

BS 3289 : 1982 Specification for conveyor belting for underground use in coal mines. British Standards Institution.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 MAY 2005
TO
IS 3181 : 1992 CONVEYOR BELTS — FIRE RESISTANT CONVEYOR BELTING FOR UNDERGROUND MINES AND SUCH OTHER HAZARDOUS APPLICATIONS — SPECIFICATION

(Second Revision)

(*Page* 2, *clause* 7.2) — Insert the following new clause after 7.2:

'7.3 The mean belt thickness (*see* 7.1) and the derived carcass thickness (*see* 7.2) shall not be less than as given below:

Minimum Belt and Carcass Thickness

Belt Type	Belt Thickness mm	Carcass Thickness mm
1	Not specified	Not specified
2	Not specified	Not specified
3	7.5	5.9
4	8.0	6.4
5	8.5	6.9
6 and above	9.0	7.4

(MGP 29)

Reprography Unit, BIS, New Delhi, India

Indian Standard

CONVEYOR BELTS — FIRE RESISTANT CONVEYOR BELTING FOR UNDERGROUND MINES AND SUCH OTHER HAZARDOUS APPLICATIONS — SPECIFICATION

(Second Revision)

1 SCOPE

This standard covers the requirements for fire resistant conveyor belting made from fire resistant compounds and textile reinforcements for use in underground mines and such other hazardous applications where risk of fire is involved.

2 CONSTRUCTION

2.1 The belting shall be of solid woven construction or shall consist of plies of woven fabric and shall be impregnated with a fire resistant compound and have fire resistant covers, the whole being fused or vulcanised together in accordance with the best manufacturing practice.

2.2 The edges of the belting shall be completely sealed by fire resistant compound.

2.2.1 Where the edge cover material is manufactured and applied separately (its width shall not be more than 5 mm) to produce good adhesion it shall be fused or vulcanized to the edges of the surface covers and the fabric.

3 FABRIC

The fabric used shall be evenly and firmly woven and substantially free from foreign matter and manufacturing fault as is normal in the best manufacturing practice.

4 DESIGNATION AND PROPERTIES OF BELTING

Belting complying with the requirements of this specification shall be designated by belt type according to its physical properties as given in Table 1.

5 LENGTH

The length of belting shall be specified by the purchaser. The tolerance on length on individual rolls shall be + 2 percent to — 0 5 percent and the total length supplied for a specific installation shall be not less than the specified length ordered.

NOTE — However, lengths outside these limits occasionally resulting due to manufacturing limitations may be accepted as agreed between manufacturer and purchaser.

Table 1 Designation and Properties of Finished Belting

(*Clause* 4)

Belt Type	Designation	Breaking Strength Minimum		Elongation at Break Minimum		Tear Strength Minimum
		Longitudinal kN/m	Transverse kN/m	Longitudinal Percent	Transverse Percent	kN
1	2 700	470	235	17	18	1·00
2	3 000	525	265	17	18	1·00
3	3 500	610	265	17	18	1·09
4	4 000	700	352	17	18	1·09
5	5 000	875	352	15	18	1·18
6	6 500	1 140	352	Not specified		1·54
8	8 000	1 400	352	Not specified		1·54

NOTE — When belting is required for special applications with breaking strengths above or below those in Table 1, the form of construction and minimum properties shall be agreed between purchaser and manufacturer.

6 WIDTH

6.1 The belting shall be manufactured in the following nominal widths: 500, 600, 650, 750, 800, 900, 1 000, 1 050, 1 200, 1 400 and 1 600 mm.

NOTE — Where necessary subject to agreement between purchaser and supplier, widths other than the above may be specified.

6.2 The width of the belting shall at no point vary from the specified dimensions by more than the amount given in col 2 of Table 2 but in any one length of belting the total variation in width shall not exceed the figures in col 3 of Table 2.

7 BELT AND CARCASS THICKNESS

7.1 The belt thickness shall be measured in accordance with the method given in Annex A. Using this method, the difference between any

two of the seven measurements of the belt thickness shall not exceed.

a) 1 mm for a belt of which the mean thickness does not exceed 10 mm.

b) 10 percent of the mean belt thickness for a belt of which the mean thickness exceeds 10 mm.

Table 2 Tolerances of Width

(*Clause* 6 2)

Width of the Belting	Tolerance	Total Variation in Any One Length
(1)	(2)	(3)
Up to and including width of 600 mm	+ 10 mm − 5 mm	10·0 mm
For width over 600 mm	+ 2 % of width − 1 % of width	2 % of width

7.1.1 When measured in accordance with the method described in Annex A, the mean belt thickness shall not vary by more than 1 mm with respect to that specified for belts up to 10 mm thickness or shall not vary by more than 10 percent of the specified value for belt thickness over 10 mm thickness.

7.2 The carcass thickness shall be derived by subtracting the sum of the mean thickness of top and bottom covers, as measured in accordance with the method given in Annex A from the mean belt thickness as measured in accordance with the method given in Annex A.

8 COVER THICKNESS

8.1 Both the carrying and non-carrying faces of the belting shall be protected by covers of specified thickness appropriate to the operational requirement and when measured in accordance to the method described in Annex A, the average thickness value shall not fall below the specified value by more than 10 percent.

8.2 The cover material shall consist of fire resistant compound.

8.2.1 The thickness of the cover shall be as specified by the purchaser.

8.3 The cover thickness within 25 mm of the belt edge shall be not less than:

a) 50 percent of the specified cover thickness for cover of less than 1 mm.

b) 70 percent of the specified cover thickness for cover of 1 mm or more.

8.4 Where belting is to be used in conditions which require additional protection of the carcass or improved abrasion resistance, covers thicker than specified shall be permitted in specified mean thickness of 1 mm, 2 mm or 3 mm.

8.5 Where a different material is fused or vulcanised on to existing specified cover material as additional cover thickness, the specified cover thickness will refer only to the thickness of the additional cover material.

9 JOINT IN FABRIC

9.1 Transverse Joint

9.1.1 In solid woven belting, there shall be no transverse joint in the carcass.

9.1.2 Transverse joints in the fabric plies of multi-ply belts shall be at an angle of not greater than 60° and not less than 45° to the longitudinal axis. The minimum distance between transverse joints shall be as follows:

a) *Outer plies* — Joints in outer plies shall be not less than 100 m apart in the same ply. The adjoining edges shall butt closely together and shall not overlap.

b) *Inner plies* — Joints in inner plies shall be not less than 15 m apart in the same ply and there shall be not more than two joints in any one ply in each 200 m of belting. The adjoining edges shall butt closely together and shall not overlap.

c) *Adjacent plies* — Joints in adjacent plies shall be not less than 3 m apart.

d) *Non-adjacent plies* — Joints in non-adjacent plies shall be separated by a distance not less than the width of the belting.

9.2 Longitudinal Joints

9.2.1 There shall be no longitudinal joints in the carcass of solid woven belts.

9.2.2 For plied belts, the number of longitudinal joints in the plies shall be as given in Table 3. The adjoining edges shall butt closely together and shall not overlap.

Table 3 Number of Longitudinal Joints in the Plies

Width of Belt	No. of Longitudinal Joints	
	Outer Ply	Inner Ply
Up to and including 1 200 mm	0	0
Above 1 200 up to and including 1 600 mm	1	2

10 FREEDOM FROM DEFECTS

The belting shall be straight when laid out flat. The surface of finished belting shall be free from blisters, pitting or other major surface flaws and shall be completely sealed against ingress of moisture.

11 FULL THICKNESS BREAKING STRENGTH AND ELONGATION

11.1 The longitudinal and transverse breaking strength and the elongation of the finished belting shall be the average values determined in accordance with the method described in Annex B. The breaking strength and elongation of the finished belting shall be not less than the value given in Table 1.

11.2 Elongation at Reference Load

The elongation of the finished belting in the longitudinal direction at the reference load (viz one tenth of the specified longitudinal full thickness breaking strength) shall not be greater than 4 percent.

NOTE — The elongation at the reference load is intended as a control test only and cannot be related exactly to stretch characteristics in service. The elongation parameters at reference load and at break as stipulated in **11.2** and Table 1 respectively shall be applicable for belting up to and including Type 5. For other types viz Type 6 and Type 8, the parameters remain unspecified till sufficient data is generated based on the actual performance of these type of belts.

12 TEAR STRENGTH

The tear strength of the finished belting shall be measured as described in Annex C and the average value in sense A and in sense B shall be not less than the values given in Table 1.

13 ADHESION

13.1 The adhesion between cover and carcass and between adjacent plies in plied construction belting shall be tested longitudinally and transversely as per method described in Annex D and shall be not less than the values given in Table 4.

Table 4 Adhesion Requirements

	Adhesion Between Cover and Carcass (*kN/m*)	Adhesion Between Adjacent Plies (*kN/m*)
Average of the two mean values of force from the two tests	3·15	3·5
Lower of the two minimum values of force from the two tests	2·6	2·6

13.2 Edge Adhesion

Adequate adhesion between the edge strip and the edge of the belt can normally be checked by visual and manual inspection. Adhesion shall be considered to be satisfactory if the force required to strip the edging from the belt at grip separation rate of 50 mm/min is not less than 2 6 kN/m of belt thickness when measured in a direction parallel to the edges of the belt.

14 ELECTRICAL RESISTANCE

The electrical resistance shall be measured in accordance with the method described in Annex E and the average value on both the upper and lower surfaces of the belting shall be not greater than 3×10^8 ohms.

15 FIRE RESISTANCE

15.1 Drum Friction Test

a) The belting shall be tested as per method described in Annex F and there shall not be any visible sign of flame or glow on any part of any one of the test pieces of belting either during each test or after each test piece breaks. The temperature of the surface of the drum during each test shall not exceed 325°C.

b) The drum friction test should be carried out for the purpose of approval of a given construction as a type test.

15.2 Spirit Burner Flame Test

When tested as per method described in Annex G, the belt shall comply with the following:

a) For the six test pieces with the outer covers intact, the average time for all visible flame or glow to disappear after withdrawal of the burner shall not exceed 3 seconds. No individual test piece shall flame or glow for more than 10 seconds.

In the event that in individual test piece continue to flame or glow for more than 10 seconds and the average flame or glow time does not exceed 3 seconds a further six test pieces shall be tested. The average flame or glow time for these further test pieces shall not exceed 3 seconds and no individual test piece shall exhibit flame or glow for more than 10 seconds.

b) For the six test pieces with outer covers removed, the average time for all visible flame or glow to disappear after the withdrawal of the burner shall not exceed 5 seconds. No individual test piece shall flame or glow for more than 15 seconds.

In the event of individual test piece flames or glows for more than 15 seconds and the average flame or glow time does not exceed 5 seconds, a further six test pieces shall be tested. The average flame or flow time for these further test pieces shall not exceed 5 seconds and no individual test pieces shall flame or glow more than 15 seconds.

15.3 Propane Burner Test

The belting shall be tested as per the method described in Annex H and shall be self extinguishing, after the propane flame has been removed, all combustion shall cease and a minimum of

250 mm long full width portion on each test piece shall remain undamaged at the completion of the test. In the event of one test piece failing, the sample shall be deemed to have failed the specification requirement.

NOTE — Till such time facilities for conducting propane burner test are developed in the country, it shall be a type approval test and may be got done from either British Coal or any other alternative source.

16 MARKING

The belting shall be marked on one face with the following information using characters not less than 20 mm high. Marking shall be repeated at a maximum longitudinal spacing of 10 m, at approximately 100 mm from the left and right edges alternately. In the case of belts of unequal cover thickness the marking shall be on the thicker cover:

a) Letters or trade mark identifying the manufacturer.

b) Year of manufacture.

c) Belt type number.

d) Specified cover thickness.

e) The number of this Indian Standard i.e., IS 3181.

The marking shall be sufficiently durable to withstand abrasion during transport, storage, installation and service.

17 SAMPLING AND TESTING

17.1 The number of samples to be tested for compliance with the requirements of this specification shall be in accordance with Table 5 Each sample shall be full belt width and not less than 600 mm long.

Table 5 Sampling

(*Clause* 17.1)

Length of Belting Ordered of One Type and Width in m		Number of Samples
From	Up to and Including	
—	500	1
501	1 000	2
1 001	2 000	3
2 001	3 500	4
3 501	5 000	5
5 001	7 000	6
7 001	10 000	7
For each additional	3 500	1

17.2 The samples shall be cut from the belting not less than 24 h after the completion of manufacture.

17.3 Retest and Rejection

Should any sample fail to comply with the specified test requirements, two additional samples shall be drawn and tested after conditioning them in a standard atmosphere of 65 ± 5 % relative humidity and 27 ± 2°C temperature for 3 days before testing. In the event of either of these two samples failing to comply with the test requirements, the supply shall be rejected. If both the samples pass the tests, the supply shall be accepted.

18 PACKING

The belting shall be packed as mutually agreed upon between the purchaser and the manufacturer.

ANNEX A

(*Clauses* 7.1, 7.1.1, 7.2 *and* 8.1)

METHOD OF MEASURING BELT AND COVER THICKNESS

A-1 METHOD OF MEASURING BELT THICKNESS

A-1.1 The belt thickness is measured on a cut edge of unstripped belt.

A-1.2 Apparatus

A micrometer dial gauge graduated in divisions of 0·01 mm.

The dial gauge is firmly held in a rigid stand over a flat baseplate of width at least 100 mm and is fitted with a flat contact of diameter 19 ± 2 mm which is square to the plunger and parallel to the baseplate.

The working force at the contact surface, measured with a dial gauge in vertical position shall be 0·50 ± 0·20 N.

A-1.3 Preparation of Test Piece

Cut the belt across its full width at right angles to the surface and edges of the belt ensuring that the line of the cut is not within 50 mm of any embossed marking on the surface of the belt.

Mark but do not cut the sample at each of the seven points shown in Fig. 1A.

A-1.4 Procedure

Hold the test piece flat on the base plate, with the dial gauge contacting the belt at the positions indicated in Fig. 1A, by means of finger pressure each side of the position of the dial gauge contact. Support the belt at the same height as the surface of the base plate of the dial gauge. Measure the thickness of the belt at each of the seven points shown in Fig. 1A, each value being rounded to two decimal places.

NOTE — The points may be marked on a line of an angle to the edge of the test piece as in Fig. 1B. This will enable both belt thickness and cover thickness measurements to be obtained from one set of markings.

A-1.5 Expression of Results

Record each of the seven thicknesses and calculate the mean belt thickness.

A-2 OPTICAL METHOD OF MEASUREMENT OF COVER THICKNESS

A-2.1 The top and bottom cover thickness shall be measured on a cut edge of unstripped belt. Measurement shall be made of the distance along the normal from the face of the belt to the top of the fabric knuckle as shown in Fig 1B.

A-2.2 Apparatus

The measuring instrument shall be an optical magnifier incorporating a scale graduated in division of 0·01 mm.

A-2.3 Preparation of Test Piece

The belt shall be cut across its full width at right angles to the surface and obliquely to the edge of the belt.

The line of the cut, which shall not intersect any embossed markings on the surface of the belt, shall be determined by marking one edge of the belt at a point A and the other by a point B directly opposite A. A point C shall be marked on the same edge as B and 50 mm from it. The belt shall be cut on the line AC as shown in Fig. 1B.

The cut section of the belt shall be divided between points A and C into eight parts by seven lines extending across the cut edge. The two parts adjacent to the edges shall each extend 25 mm into the belt and the remaining portion shall be divided into six equal parts.

A-2.4 Procedure

A-2.4.1 For each cover, measure the distance between the surface of the belting and the top of the fabric knuckles to the nearest half division at the fabric knuckles nearest to each of the seven lines, as shown in Fig. 1B.

A-2.4.2 Measurement of minimum thickness within 25 mm of belt edges — Examine the cover thickness within 25 mm of the belt edges and measure the minimum distance between the surface of the belt and the fabric knuckles as shown in Fig. 1B, for each cover.

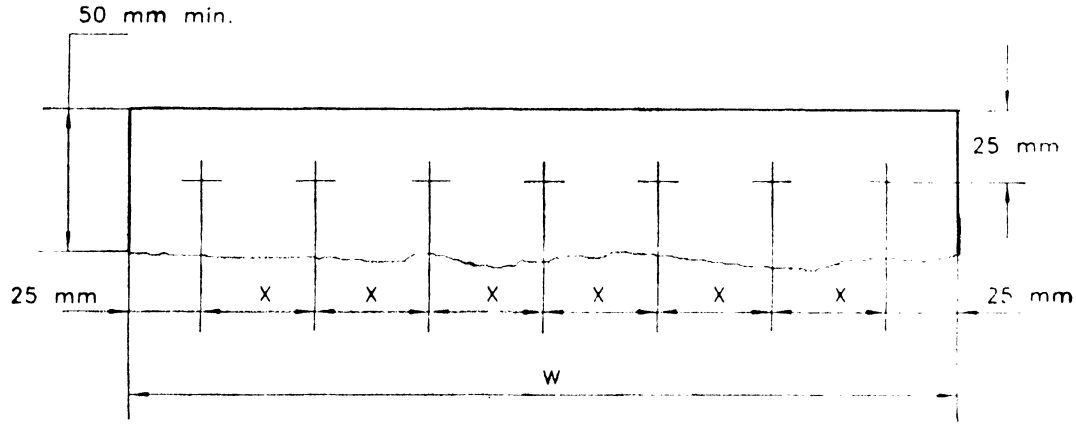
NOTE — t_1 and t_7 are the distances between the surface (top cover) of the belt and the exposed fabric at the nearest knuckle to each of the two lines D and E. t_2 to t_6 are the distances between the surface (top cover) of the belt and the exposed fabric at the nearest knuckle to each of the five lines

$$\text{Cover thickness (top cover)} = \frac{t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7}{7}$$

where visual inspection reveals a localised thin portion(s) of cover, the average cover thickness

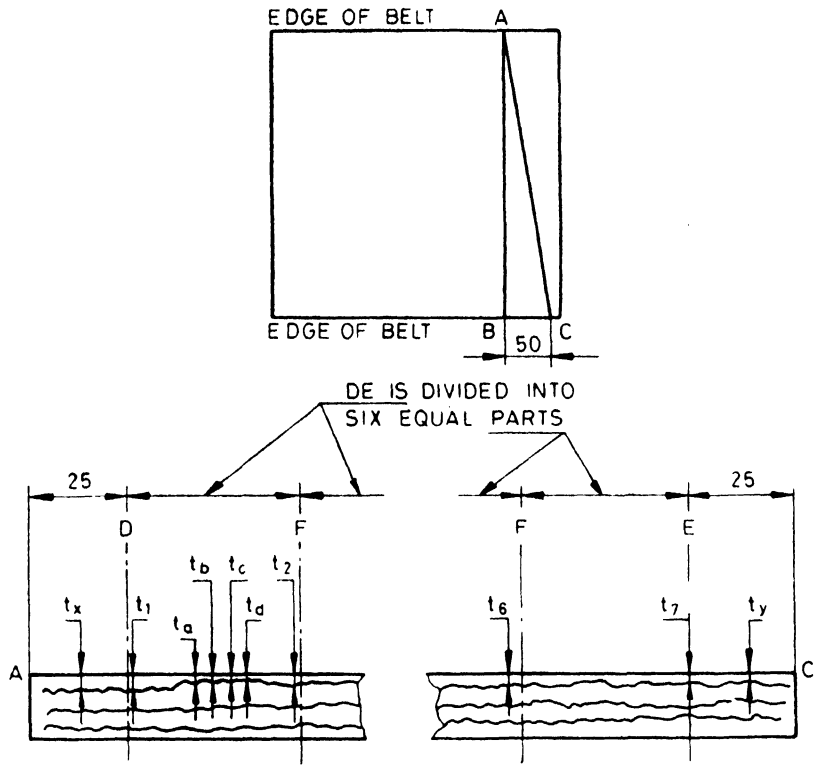
$\frac{t_a + t_b + t_c + t_d}{4}$ is determined over four adjacent knuckles of the fabric within the affected area.

t_x and t_y are the minimum readings within 25 mm of the edges. The same procedures are repeated for the bottom cover.



$$X = \frac{W - 50}{6} \text{ mm}$$

FIG. 1A MEASUREMENT OF BELT THICKNESS



All dimensions in millimetres.

FIG. 1B MEASUREMENT OF COVER THICKNESS

A-2.5 Expression of Results

a) Record each measurement.

b) The mean cover thickness shall be the average of the seven measurements made adjacent to the dividing lines.

c) The thickness of any localised thin cover shall be the average of the four measurements made within the affected areas.

d) Cover thickness within 25 mm of the belt edges shall be the minimum cover thickness measurements made within these areas.

ANNEX B

(*Clause* 11.1)

METHOD OF TEST FOR BREAKING STRENGTH AND ELONGATION

B-1 PRINCIPLE

The longitudinal and transverse breaking strengths and elongations at break shall be measured on samples of conveyor belting with covers intact using dumb-bell shaped test pieces.

The test pieces shall be held in the grip of a suitable tensile testing machine. The grip shall be separated at a defined rate and the maximum load observed before the test piece breaks shall be recorded as the breaking strength of the test piece. The elongation at break shall also be recorded.

B-2 APPARATUS

A tensile testing machine complying with the following requirements shall be used.

B-2.1 The accuracy of the machine shall be within 1 0 percent.

B-2.2 The range of the machine shall be chosen so that the forces to be measured come within 80% of the full scale deflection.

B-2.3 For the tensile strength test, the machine shall have either an autographic force recorder or a maximum force indicator. For the adhesion and tear tests the machine shall have an autographic

force recorder and the natural frequency, inertia and damping characteristics shall be such that it is capable of recording fluctuation of the separating force.

B-2.4 The force shall be applied smoothly without any jerking or intermittent action and the power shall be sufficient to stress the test piece to the point of fracture at a rate of travel of 100 ± 5 mm per minute for the tensile strength test and 50 ± 2·5 mm per minute for the adhesion and tear tests

B-2.5 The jaws of the machine shall move without undue friction and in correct alignment.

B-2.6 The jaws of the machine shall hold the test piece without slip and without damage.

NOTES

1 An example of a suitable grip is shown in Fig. 2. For very thick belts, double compartment grips as shown in Fig. 3 have been found to be more suitable.

2 The serrations of the grips shall be suitable to give adequate grip to the belt without damage to the carcass.

3 Hydraulically operated unserrated grips or other such devices may be used for this test provided that they do not cause the test piece to break near the jaws rather than at its centre.

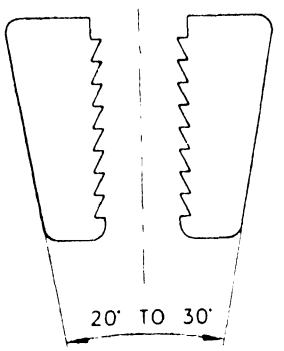


FIG. 2 EXAMPLE OF SUITABLE SINGLE COMPARTMENT GRIP

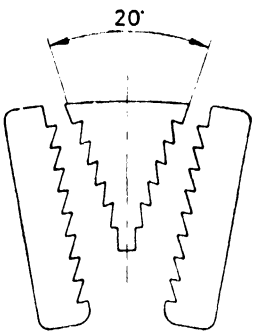


FIG. 3 EXAMPLE OF SUITABLE DOUBLE COMPARTMENT GRIP

B-3 TEST PIECE SHAPE AND DIMENSIONS

The test piece shall conform on both faces to the shape and dimensions shown in Fig. 4 and shall be cut by the use of a suitable die such as shown in Fig. 5. The test pieces shall be representative of the condition and thickness of the main body of the belt.

B-4 PREPARATION OF TEST PIECES

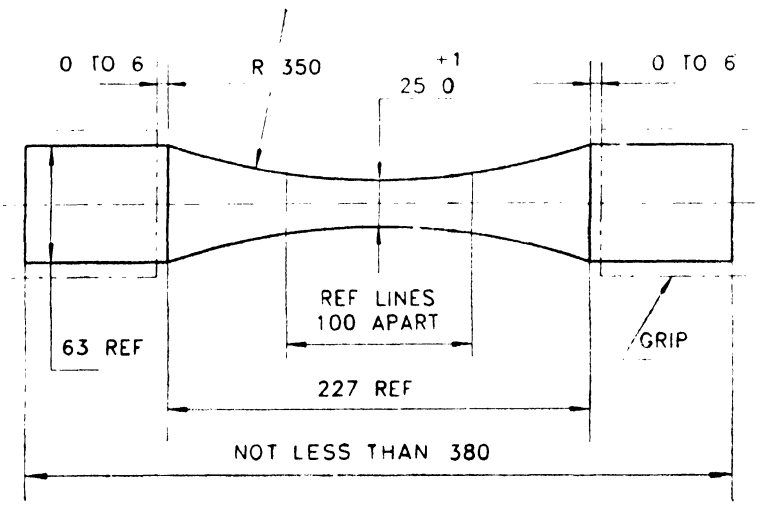
B-4.1 Cut six test pieces, three in the longitudinal direction parallel to the length of the belt and three in the transverse direction at right angles to the length of the belt.

NOTES

1 The test pieces shall be cut from places widely spaced from each other, so as to be representative of the whole area of the sample of belting.

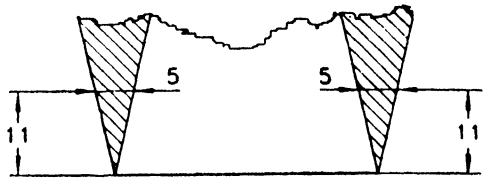
2 The test piece shall contain no joints.

3 No test piece shall be cut from the sample with its longitudinal edge less than 12 mm from an edge of the sample.



All dimensions in millimetres.

FIG. 4 TENSILE TEST PIECE



All dimensions in millimetres.

FIG. 5 CROSS SECTION OF DIE

B-4.2 Condition the test pieces in a standard atmosphere of 65 ± 5 percent relative humidity and 27 ± 2°C temperature for three days and immediately test at that temperature and relative humidity.

B-5 PROCEDURE

B-5.1 Place the end of the test piece symmetrically in the grips of the tension testing machine and separate the grips at a constant rate of transverse at a speed of 100 ± 5 mm/min, until the test piece breaks. Record the maximum breaking strength.

NOTE — The results of breaks occurring outside the defined section marked by reference line shall normally be discarded and retests made.

B-5.2 Determine the elongation values by measuring on the centre line of the test piece the distance between the reference lines of the defined 100 mm gauge length, as shown in Fig. 4, at the moment of break of the test piece.

NOTE — This may conveniently be done by following the extension with dividers or by means of a suitable extensometer operating in direct contact with the test piece.

B-6 EXPRESSION OF RESULTS

B-6.1 The breaking strength as recorded of each of the six test pieces shall be reported separately. The average value for each of the two sets of three tests on the test pieces cut longitudinally and transeversely from the belt shall be calculated and reported.

B-6.2 The elongation at break of the test piece shall be expressed as a percentage of the initial 100 mm gauge length.

The elongation at break of each of the six test pieces shall be reported separately together with the average value for each of the two sets of three tests on the test pieces cut longitudinally and transversely from the belt.

ANNEX C

(*Clause* 12)

METHOD OF TEST FOR TEAR STRENGTH

C-1 PRINCIPLE

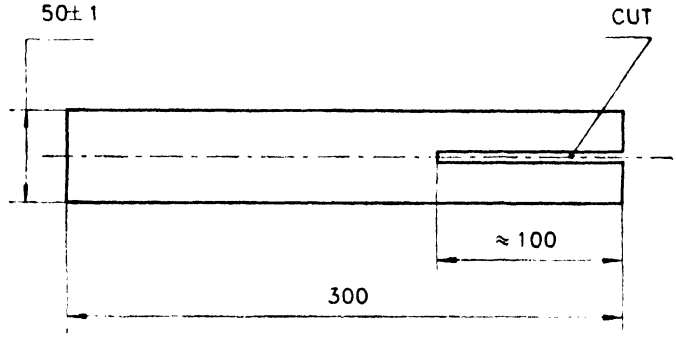
The force required to extend a cut made in a test piece taken from a sample of conveyor belting with covers intact is determined by means of a suitable tensile testing machine.

C-2 APPARATUS

Tensile testing machine complying with requirements given in Annex B.

C-3 TEST PIECE

C-3.1 Cut two test pieces parallel to the length of the belt each being a rectangular strip of the full thickness of the belt and measuring 50 ± 1 mm wide and 300 mm long. Cut each test piece down the centre, parallel with the sides, for a length of approximately 100 mm from the end so as to form the two legs as shown in Fig. 6.



All dimensions in millimetres.

FIG. 6 TEST PIECE FOR TEAR TEST

C-3.2 Mark each test piece with a letter *T* on the top cover of the belt. This mark is made at the same end of each test piece in relation to the run of the belt as shown in Fig. 7.

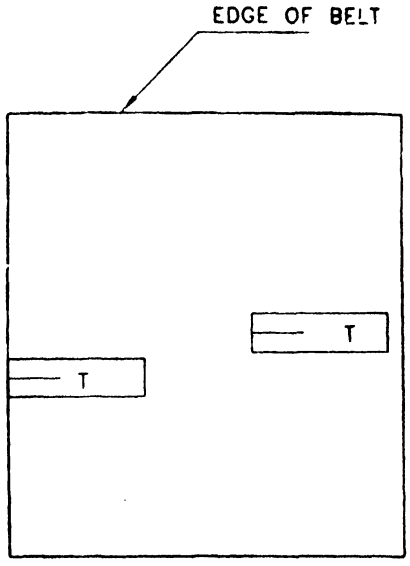


FIG. 7 ARRANGEMENT AND MARKING ON TEST PIECES FOR TEAR TEST

C-4 CONDITIONING OF THE TEST PIECE

C-4.1 Condition the test pieces, prior to test in a standard atmosphere of 65 ± 5 percent relative humidity and 27 ± 2°C temperature for three days and immediately test at that temperature and relative humidity.

C-5 PROCEDURE

C-5.1 Hold the two legs of a test piece in the grips of the testing machine, one in each grip. Clamp the legs, with the inner cut edges located at the centre of the grips and the legs set parallel to the direction of the traverse Separate the grips at a constant rate of transverse at a speed of 50 ± 2 5 mm/min, and make an autographic record of the force required to tear the test piece a further 100 mm.

C-5.2 Ignore the initial rise of the trace on the autographic record and determine the mean tearing force from the autographic record over a length of trace corresponding to not less than 75 mm of tearing.

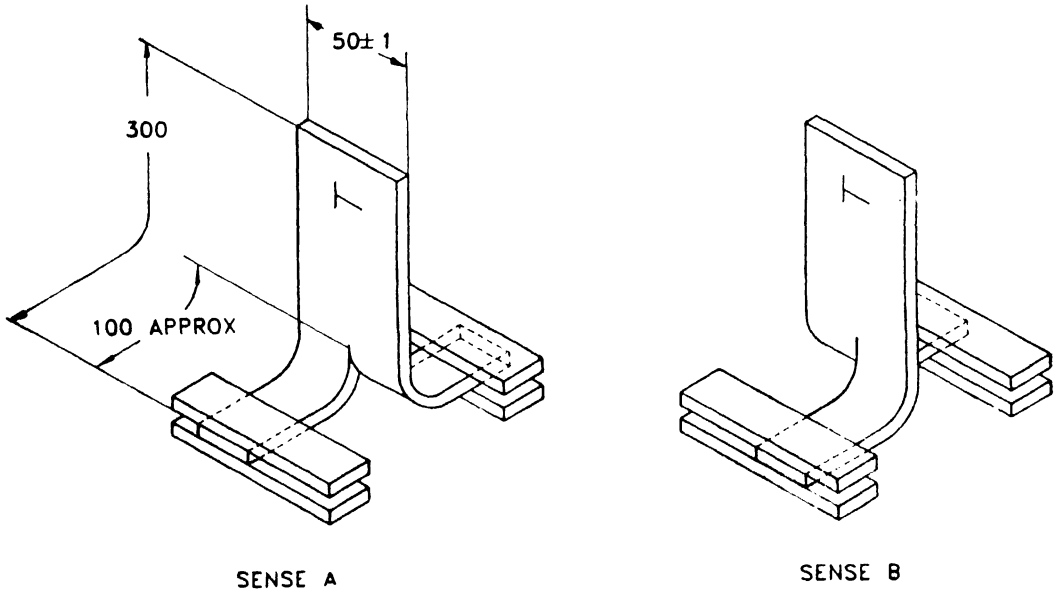
C-5.3 Test one test piece in Sense A and the other in Sense B as shown in Fig. 8.

C-6 EXPRESSION OF RESULTS

C-6.1 Report the mean tearing force in kN.

C-6.2 The following results shall be recorded:

a) The mean tearing force of each of the two test pieces from the autographic record over a length of the trace corresponding to at least a 75 mm tear.



All dimensions in millimetres.

FIG. 8 ILLUSTRATION OF THE TWO SENSES OF TESTING FOR TEAR TEST

b) In cases where the threads of the fabric pull out before direct tearing takes place, a statement to this effect is made and the mean tearing force recorded.

NOTE — In determining the mean tearing force from the autographic record, a visual determination may be taken by mutual consent of the manufacturer and the purchaser. In cases of dispute or where substantial fluctuation of force occur, carry out the following procedure:

a) Draw a mean curve through the centres of oscillation of the trace, this represents the tearing force curve.

b) Determine the mean height of the tearing force curve either visually or by suitable graphical means and represent it by a straight line drawn parallel to the base line of the autographic record, the height of the line to scale defines the mean tearing force.

ANNEX D

(*Clause* 13.1)

METHOD OF TEST FOR ADHESION

D-1 PRINCIPLE

The force required to strip one ply from the next and also to strip the cover from the carcass it determined by means of a suitable tensile testing machine.

D-2 APPARATUS

Tensile testing machine complying with the requirements given in Annex B.

D-3 TEST PIECE

Rectangular strip 25 ± 1·0 mm wide and 300 mm long.

D-4 PREPARATION OF TEST PIECES

Cut one pair of test pieces in the longitudinal direction parallel to the length of the belt and one pair in the transverse direction at right angles to the length of the belt, each test piece measuring 25 ± 1 mm wide and 300 mm long and having clean edges. Cut the test piece from places widely spaced from each other so as to be representative of the sample of belting.

D-5 PROCEDURE

D-5.1 Expose test pieces in a standard atmosphere of 65 ± 5 percent relative humidity and 27 ± 2°C temperature for at least 24 hours and then immediately test at that temperature and humidity.

D-5.2 At one end of the test piece separate one of the covers from the first ply for a distance of approximately 75 mm. Fix the separated ends in the grips of the tensile testing machine and make an autographic record of the force required to strip a further 100 mm with a rate of traverse of the driven jaw of 50 ± 2·5 mm/min. Ensure that the unstripped part of the test piece is free from support during the test.

D-5.2.1 Ignore the initial rise of the trace on the autographic record and determine the mean and minimum values of stripping force from the autographic record over a length of trace corresponding to not less than 75 mm of stripping.

D-5.2.2 Repeat the test using the same test piece for each consecutive ply to the middle of the test piece. Repeat the tests on the second test piece of the pair commencing with the opposite cover and again working to the middle of the test piece.

D-5.3 Expression of Results

Express the results in kN/m.

D-5.3.1 For test pieces taken both parallel to the length of the belt and at right angles to the length of the belt, the following are to be reported:

a) between each cover and adjacent ply, the average of the two mean values of the stripping force from the two tests and the lower of the two minimum values of stripping force from the two tests.

b) between adjacent plies, the average of the two mean values of the stripping force from the two tests and the lower of the two minimum values of stripping force from the two tests.

D-5.3.2 In determining the mean and minimum values of stripping force from the autographic record, a visual determination may be taken by mutual consent of the manufacturer and purchaser. In case of dispute, or where substantial fluctuations of force occur, carry out the following procedure:

a) Draw a mean curve through the centres of oscillation of the trace, this represents the stripping force curve.

b) Determine the mean height of the stripping force curve, either visually or by suitable graphical means and represent it by a straight line drawn parallel to the base line of the autographic record, the height of the line to scale defines the mean stripping force.

c) The minimum height of the stripping force curve defines the minimum stripping force.

ANNEX E
(*Clause* 14)

METHOD OF TEST FOR ELECTRICAL RESISTANCE

E-1 PRINCIPLE

The electrical resistance is determined between electrodes placed on the surface of the belt.

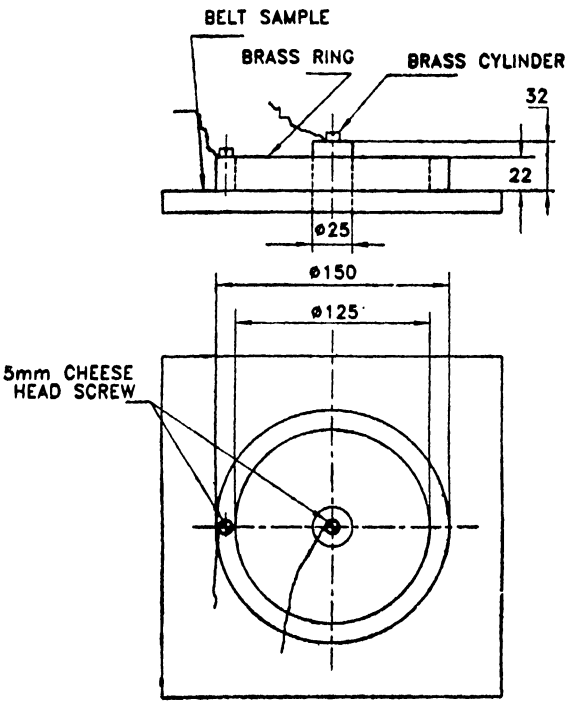
E-2 APPARATUS

E-2.1 Measuring Instrument

The resistance measuring instrument shall cover the range 10^6 ohms (1 megohm) to 10^{10} ohms (10,000 megohms) and be accurate to within $\pm$ 5 percent of the true value over this range. The potential applied to the electrode under test is between 40 and 1 000 V d.c. and is chosen so that not more than 1 W is dissipated in the test piece.

E-2.2 Brass Contact Pieces

The brass contact pieces shall consist of a cylinder and a ring of dimensions as given in Fig. 9. The lower surface of each contact piece is machined flat, polished and clean, each contact piece is provided with a flexible insulated load.



All dimensions in millimetres.

FIG. 9 TEST LAYOUT SHOWING SUITABLE WORKING DIMENSIONS OF BRASS CONTACT PIECES

E-2.3 Polythene Base Sheet

A clean sheet of polythene or other material with resistivity not less than that of polythene and of minimum dimensions of 300 mm × 300 mm × 2 mm thick.

E-2.4 Electrode System

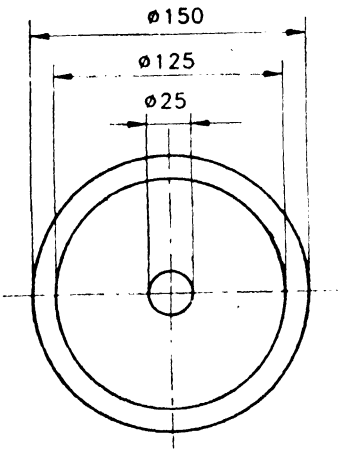
Each electrode system shall comprise two electrodes of soft thin metal foil consisting of a circular disc 25 mm in diameter with a concentric annulus having internal and external diameters of 125 mm and 150 mm respectively as shown in Fig. 10. Care is taken to ensure accuracy of the dimensions of the electrodes, but the symmetry of the annulus about the centre disc is not critical. Electrode system shall be applied to each of the test areas centrally.

NOTES

1 Suitable foils are as follows:

a) For general use :	Tin on lead, 1·5 % tin, 98·5 % lead, 0·025 mm thick 3·5 m^2/kg.
b) For indented surface :	Soft tin foil, 98·25 % tin, 1·25 % antimony, 0·5 % copper:
	i) 0·005 6 mm thick, 25 m^2/kg
	ii) 0·007 6 mm thick, 18 m^2/kg

2 The foil electrodes may be omitted if the belt surface is sufficiently smooth and flat to enable the liquid contact agent to maintain continuous contact between the belt and brass contact pieces, but with other surfaces the omission may result in the indicated resistance being higher than the true resistance.



All dimensions in millimetres.

FIG. 10 ELECTRODE SYSTEM

E-3 PREPARATION OF TEST PIECE

E-3.1 General

Prepare two test areas on the upper surface of the sample of belting and two on the lower surface, each test area measuring not less than 300 mm × 300 mm.

E-3.2 Surface Cleaning

Clean the surfaces of the test areas by dusting and rubbing with fuller's earth (B. P. Grade) using a clean pad of cloth or cotton wool. After all traces of powder have been cleaned away, wipe over the surfaces with a clean pad moistened with distilled water and then rub dry with a clean cloth.

E-3.3 Application of Electrodes

Apply the electrode system centrally on the test area.

Attach the electrodes to the test areas by a conducting liquid contact agent consisting of:

Anhydrous polyethylene glycol of relative molecular mass 600	— 4 part by mass
Soft soap	— 1/200 parts by mass
Water	— 1 part by mass

Ensure that liquid coatings of the same dimensions as the foil electrodes form on the surface.

NOTE — This may be conveniently accomplished with two felt pads of the same dimensions as the electrodes, moistened with the contact agent.

Rub the electrodes on to the test surface with a finger or small soft pad. If the surface is indented ensure that after rubbing the foil electrodes clearly follow the indentations. Do not smear the contact agent on the surface between the central disc and the annulus. Wipe away any small excess with a clean cotton wool pad.

E-4 PROCEDURE

Prepare and clean the sample of belting and apply the electrodes without delay as described in **E-3.3.**

Place the belting immediately in the following condition for two hours:

a) Temperature 27°C ± 2°C

b) Relative humidity 65 ± 5 percent

Test the samples without delay in the same ambient conditions.

Place the polyethylene sheet underneath the belting immediately below the test areas and mount the brass contact pieces in position on the electrodes.

Run the leads from these contact pieces direct to the measuring instrument so that the outer ring electrode is always connected to the earthed or low potential terminal and the inner cylinder to the higher potential terminal. Ensure that these leads do not touch each other, the belting, or any part of the apparatus except the terminals to which each is connected. Connect all earth terminals to the same point.

Apply the test potential from the measuring instrument to the test area and measure the resistance when a steady indication is obtained. Apply the test potential for a maximum of a five minutes.

Avoid breathing on the test areas as any condensation of moisture on to these surfaces may lead to gross inaccuracies in the resistance measured.

Repeat the test in turn on the remaining three test areas.

E-5 TEST REPORT

The following results shall be reported:

a) The electrical resistance measured on each electrode system.

b) The average value of the two resistance measurements on the upper surface.

c) The average value of the two resistance measurements on the lower surface.

ANNEX F

(*Clause* 15.1)

METHOD OF TEST FOR FIRE RESISTANCE (DRUM FRICTION TEST)

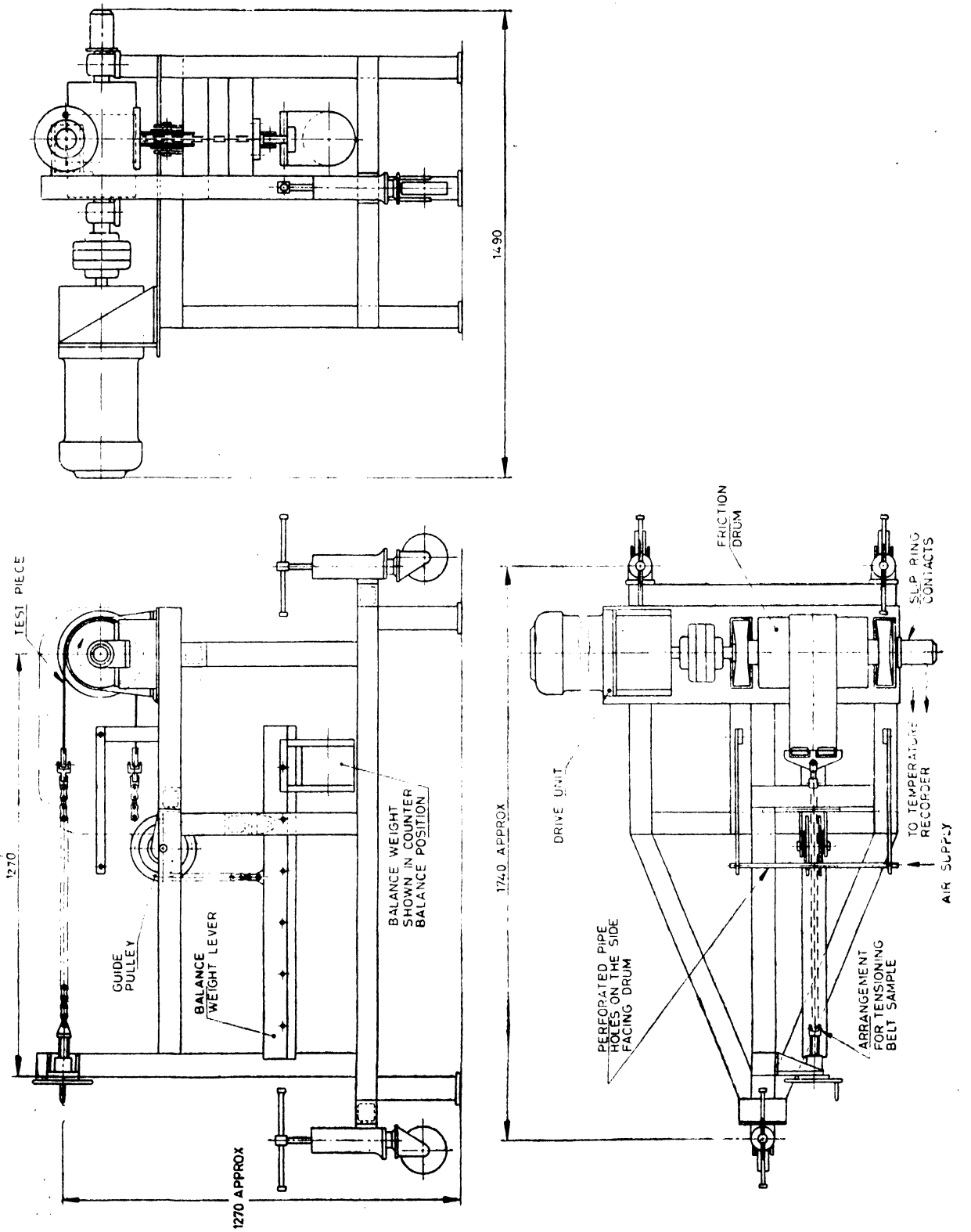
F-1 APPARATUS

The general arrangement of the drum friction apparatus is shown in Fig. 11.

F-1.1 Steel Drum

The steel drum of external diameter 210 ± 1 mm, mounted on a horizontal axle and capable of being rotated under all load conditions at 200 ± 5 rev/min. To achieve this a power supply of at least 7·5 kW is required.

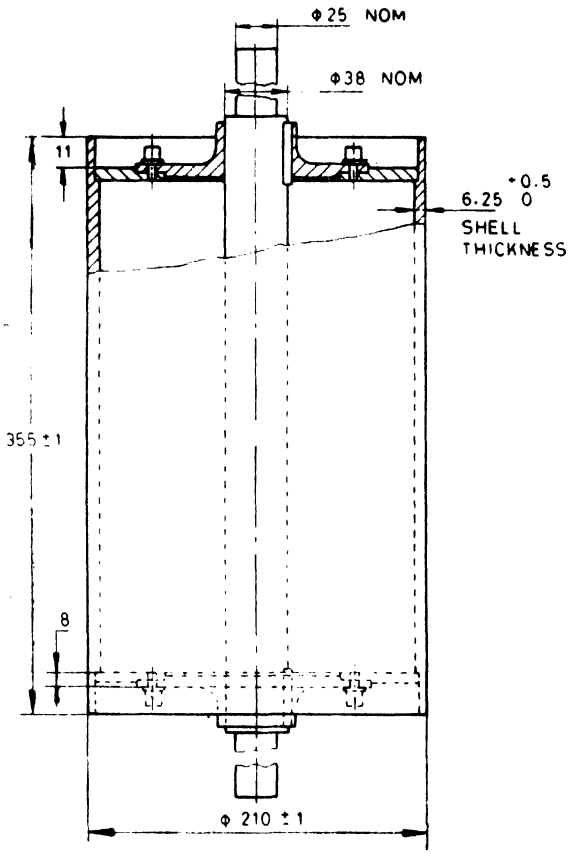
Detailed dimensions of the drum, shown in Fig. 12 are given in order to standardize its thermal characteristics. The variation in diameter along the length of any one drum is a maximum of 1 mm.



All dimensions in millimetres.

FIG. 11 GENERAL ARRANGEMENT OF DRUM FRICTION TESTING APPARATUS

Notwithstanding the dimensions and tolerances on drum diameter and shell thickness shown in Fig. 12, the effect of wear down to a minimum shell thickness of 6 mm is permissible.



All dimensions in millimetres.

FIG. 12 DRUM FOR DRUM FRICTION TESTING APPARATUS

F-1.2 Drum Temperature Measuring Device

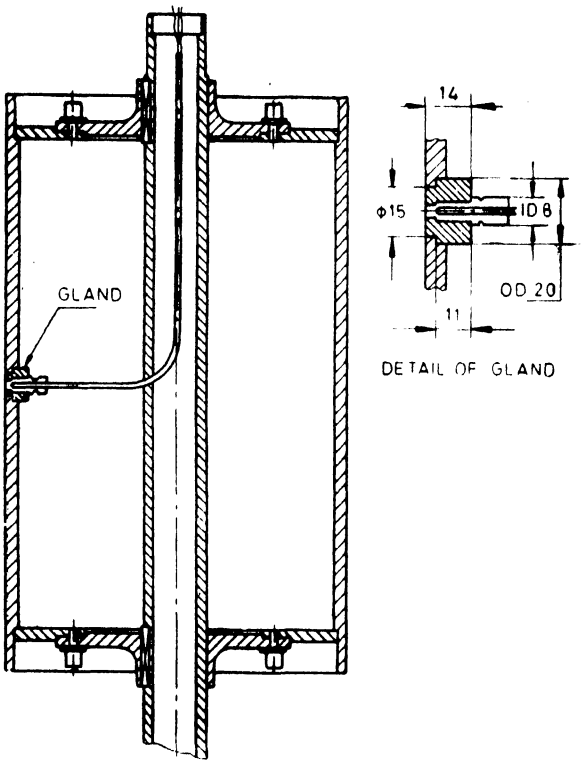
A temperature measuring device to indicate the temperature of the surface of the drum, comprising a thermocouple set with its tip not greater than 0·5 mm below the surface, midway along the drum. The method of mounting the thermocouple is shown in Fig. 13.

Care is taken to see that the effective 'cold junction' temperature is compensated for or alternatively is measured and the appropriate correction made.

NOTES

1 The functioning of the slip ring contacts should be checked periodically by observing that there is no change in the recorded temperature when the apparatus is run without a test sample.

2 The modification of the drum friction test equipment to give a more accurate measurement of the temperature of the drum surface has been included in F-1.2. However, till such time, equipments are updated to measure the temperature of the drum surface from inside as explained in F-1.2, measurement of the temperature of the outside surface of the drum shall be permitted. Temperature of the surface of the drum during the test when measured from outside surface shall at no time exceed 300°C.



All dimensions in millimetres.

FIG. 13 ARRANGEMENT OF DRUM TEMPERATURE MEASURING DEVICE

F-1.3 Tensioning System

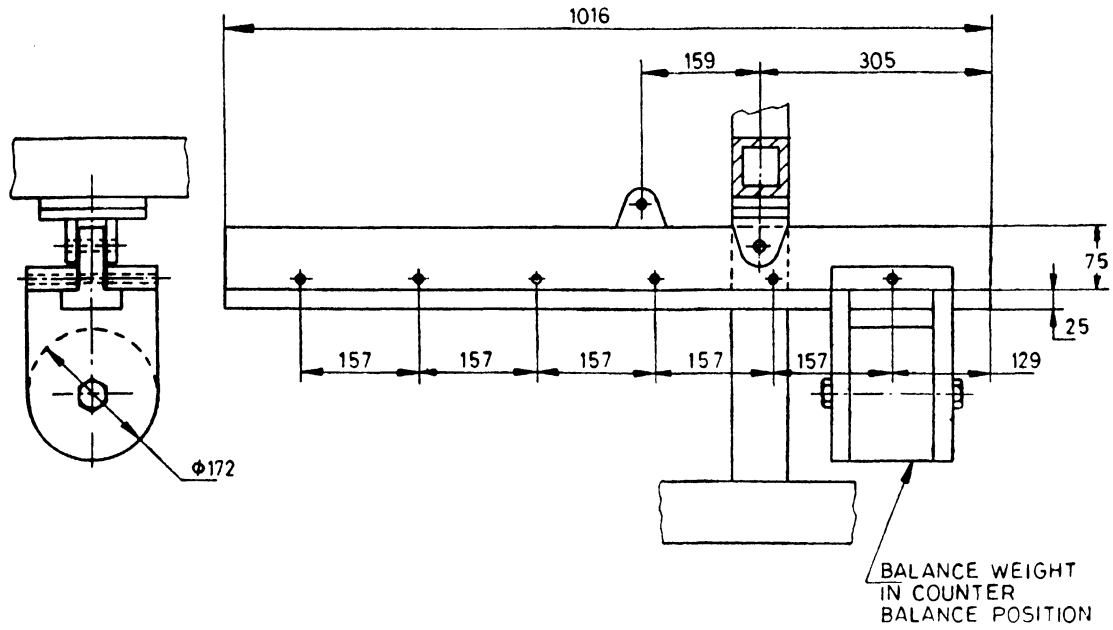
A tensioning system for applying tension to the test piece as shown in Fig. 14 shall be used. Principal dimensions of the tensioning system are given in order to standardize its moment of inertia.

F-1.4 Air Current

Suitable means shall be available for providing an air current having a velocity of 2·0 ± 0·1 m/s when measured with the test piece in position at a distance of 200 mm from the surface of the drum.

NOTE — The air current can be produced by a blower fan or from a perforated pipe supplied with compressed air. In the latter case a pipe 10 mm to 13 mm internal diameter, perforated along one side with a row of holes (0·8 mm to 1·5 mm in diameter) should be fixed horizontally at the back of the drum (i.e. between the top and bottom portions of the belt) 600 mm from the drum centre and in the same horizontal plane, with the row of holes facing the drum. Approximately 20 kPa air pressure is required at the pipe.

The actual air velocity should be measured by an anemometer and should be checked at regular intervals.



All dimensions in millimetres.

FIG. 14 BALANCE WEIGHT LEVER FOR DRUM FRICTION TESTING APPARATUS

F-1.5 Anemometer

An anemometer shall be available to measure the velocity of air current to an accuracy of ± 5 %.

Where an extractor system is provided for the removal of fumes from the vicinity of the apparatus, the velocity of the air current through the system shall not exceed 0·5 m/s.

F-2 NUMBER OF TESTS

On belting which has the same thickness and material of cover on both sides, four tests shall be carried out. Two of these tests shall be made in still air and the other two in moving air as described in **F-4.2** and **F-4.3** respectively.

With belting in which the thickness and/or the material of one cover varies from that on the other side, eight tests shall be carried out. One test in still air and one test in moving air shall be carried out when each of the two covers are in contact with the drum. Two further tests in still air and two further tests in moving air shall be carried out with the cover which when, it was next to the drum gave the worst result in the preliminary test.

F-3 PREPARATION OF TEST PIECE

Cut the test pieces parallel to the belt edge, each piece consisting of a rectangular strip of belting 150 mm wide and not less than 1·0 m long.

F-4 PROCEDURE

F-4.1 General

Prior to each test, clean the surface of the horizontal steel drum with emery cloth so as to remove all traces of any rust or debris of conveyor belting produced by carrying out previous tests. In the clean condition, the drum is bright as judged by eye and smooth to the touch. Ensure that the temperature of the drum does not exceed 30°C.

F-4.2 Test in Still Air

Pass the test piece through an arc of 180°C around the still drum. Ensure that the horizontal end is rigidly secured and the free vertical end attached to the tensioning system as shown in Fig. 14. After applying a tension of 343 N rotate the drum at 200 ± 5 rev/min away from the rigidly secured horizontal end of the test piece (i.e. similar to the forward direction of a conveyor drive) until the test piece breaks. If the test piece has not broken after 60 min increase the tensions as follows whilst the drum is still rotating:

a) by 343 N to 686 N for further period of 30 min.

b) by 343 N to 1 029 N for further period of 30 min, if necessary.

c) by 343 N to 1 372 N for further period of 10 min if necessary.

d) by 343 N to 1 715 N the test being continued at 1 715 N until the test piece breaks.

Examine the test piece for any visible signs of flame or glow during the test. After the test piece has broken, leave the two pieces within the influence of the specified air current until either flame or glow occurs or it is clear that niether is possible.

Record the surface temperature of the drum during the test.

NOTE — It may be necessary in the initial stages of a test, to reduce the tension in the sample by reducing the force applied to the free end in order to prevent the motor driving the drum from stalling. Such reductions should be kept to the minimum possible and the full initial tension of 343 N should be applied as evenly and as quickly as possible.

F-4.3 Test in an Air Current

Carry out the test in accordance with **F-4.2** using an air current as described in **F-1.4.**

The air supplied to the apparatus is at normal ambient temperature, but do not make tests in air at a temperature of less than 5°C.

F-5 TEST REPORT

The following results shall be reported:

a) The presence or absence of flame or glow in each test.

b) The maximum temperature of the surface of the drum in each test.

c) The time for the test piece to break.

ANNEX G

(*Clause* 15.2)

METHOD OF TEST FOR FIRE RESISTANCE (SPIRIT BURNER FLAME TEST)

G-1 APPARATUS

G-1.1 Burner

A spirit burner (*see* Fig. 15) fitted with a suitable device so that it can be moved away from the test piece without opening the door of the cabinet. The supply of fuel is from a reservoir having a graduated side arm as shown in Fig. 16.

G-1.2 Fuel

The burner is supplied with industrial methylated spirit. This spirit is an approximate mixture of 5 percent by volume wood naphtha (mainly methanol) and 95 percent of an ethanol/water mixture such that the relative density of the spirit is 0·814 @ 20/20°C.

The fuel is free from suspended matter and filtered before use.

G-1.3 Cabinet

The test shall be carried out in a cabinet to the design and dimensions shown in Fig. 17.

The inside of the cabinet is black. The cabinet is provided with an adjustable device to hold the test piece in position (*see* Fig. 18).

NOTES

1 Additional close fitting hole may be made in the cabinet for the entry of the remote handling device of the burner and the fuel pipe.

2 A fume hood with an extraction fan may be positioned above the cabinet, the fan may be run during the test provided that it does not induce air movement through the cabinet additional to that required for the operation of the burner. Where this condition is not satisfied, the fan is switched off during the test.

G-1.4 Stop Watch

A stop watch with graduations of at least 0·2 seconds or less. A stop watch with a 30 second full sweep is suitable.

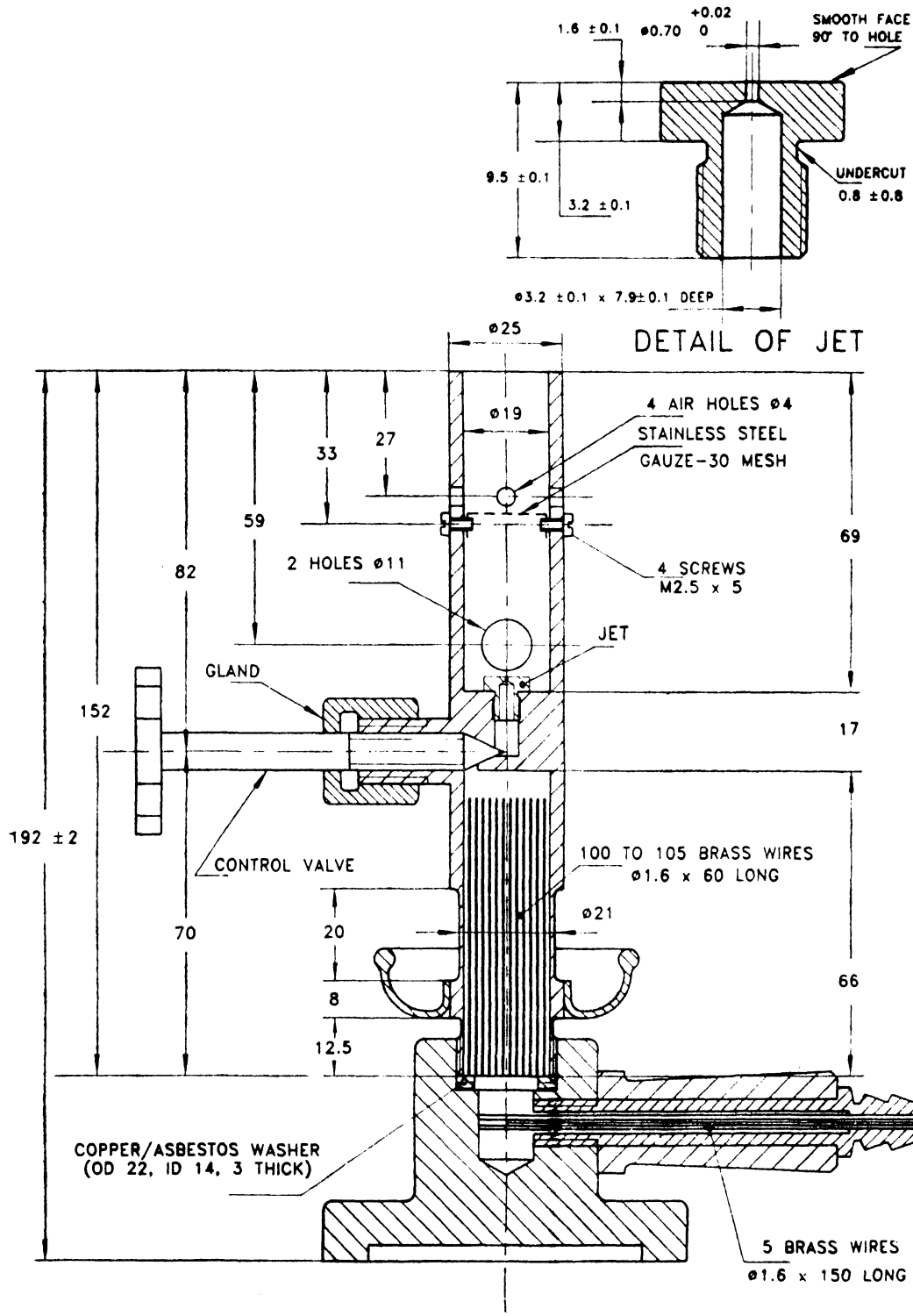
G-1.5 Band Facer

A mechanically driven band facer with a 60 grit aluminium oxide or silicon carbide band, not less than 100 mm in width.

G-2 PREPARATION OF TEST PIECES

Cut eight test pieces each 25 mm wide by 150 mm long clearly from the sample. Cut four of the test pieces parallel to the length of the belt and four at right angles to it. Cut the test pieces from places at a distance from each other, so as to be representative of the whole area of the sample of the belting.

Four of the test pieces comprising two cut in each direction are for tests with covers intact. For other four test pieces (two cut in each direction) remove the covers from the end to be tested by buffing on the band facer in the direction of the length of the test piece. Remove at least 50 mm length of the covers. Cease buffing when all the knuckles of the fabric become exposed. Only intermittent application of the test piece to the band facer is needed to minimise frictional heating. Avoid spreading a layer of PVC over the knuckles of the fabric.



Unless otherwise specified length tolerances ± 0·5
diameter tolerances ± 0·1

All dimensions in millimetres.

FIG. 15 SPIRIT BURNER

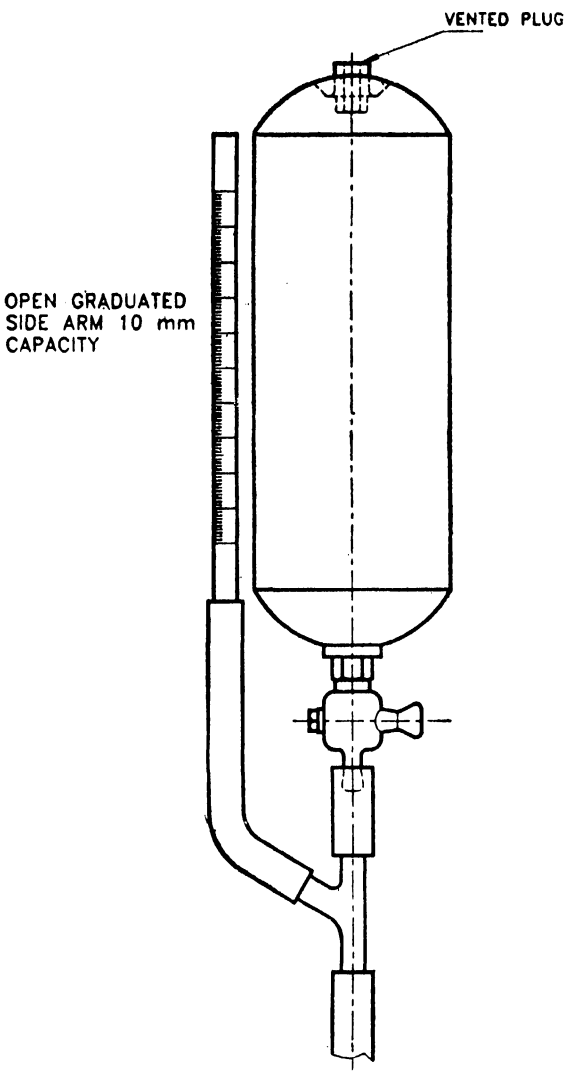


FIG. 16 RESERVOIR SIDE ARM

G-3 OPERATION OF THE BURNER

The burner is operated as follows:

a) With the control valve closed, check that the fuel consumption is zero and then heat the burner by burning fuel in the primary heating cup.

b) Adjust the reservoir so that the fuel is 760 ± 20 mm above the base of the burner. Fully open the control valve at least one turn and ignite the burner. Allow the flame to stabilise for 10 min.

c) Check the fuel consumption for at least 1 min while feeding the burner from the graduated side arm with the main reservoir tap closed. During the measurement check that the mean fuel level in the side arm is 760 mm above the burner base. Ensure that the fuel consumption so measured is 2·55 ± 0·15 ml/min.

d) During the testing, maintain the fuel level in the reservoir within the range 760 ± 20 mm above the base of the burner.

G-4 PROCEDURE

Perform the tests in the cabinet in subdued light. Light the burner and operate as described in **G-3**. Insert the test piece into the holder, ensuring that the test piece projects a minimum of 50 mm beyond the edge of the holder. Adjust the holder so that with the burner in the test position i.e., placed centrally on the base plate of the cabinet the following conditions are satisfied:

a) The faces of the test piece are vertical, the long edges horizontal, and the lower edge 50 mm above the top of the burner flame tube.

b) The test piece is located centrally in the flame with, its front edge coincident with the outer edge of the flame as given in Fig. 19.

c) The test piece is normal to the door of the test cabinet so that both faces can be observed.

Bring the burner to the test position, and simultaneously start the stop watch and close the cabinet door. After 30 seconds, move the burner quickly but smoothly away from the sample to the side of the cabinet using the remote handling device. Record the time taken for all visible flame or glow to disappear from any part of the test piece after the withdrawal of the burner.

G-5 TEST REPORT

The following results shall be reported:

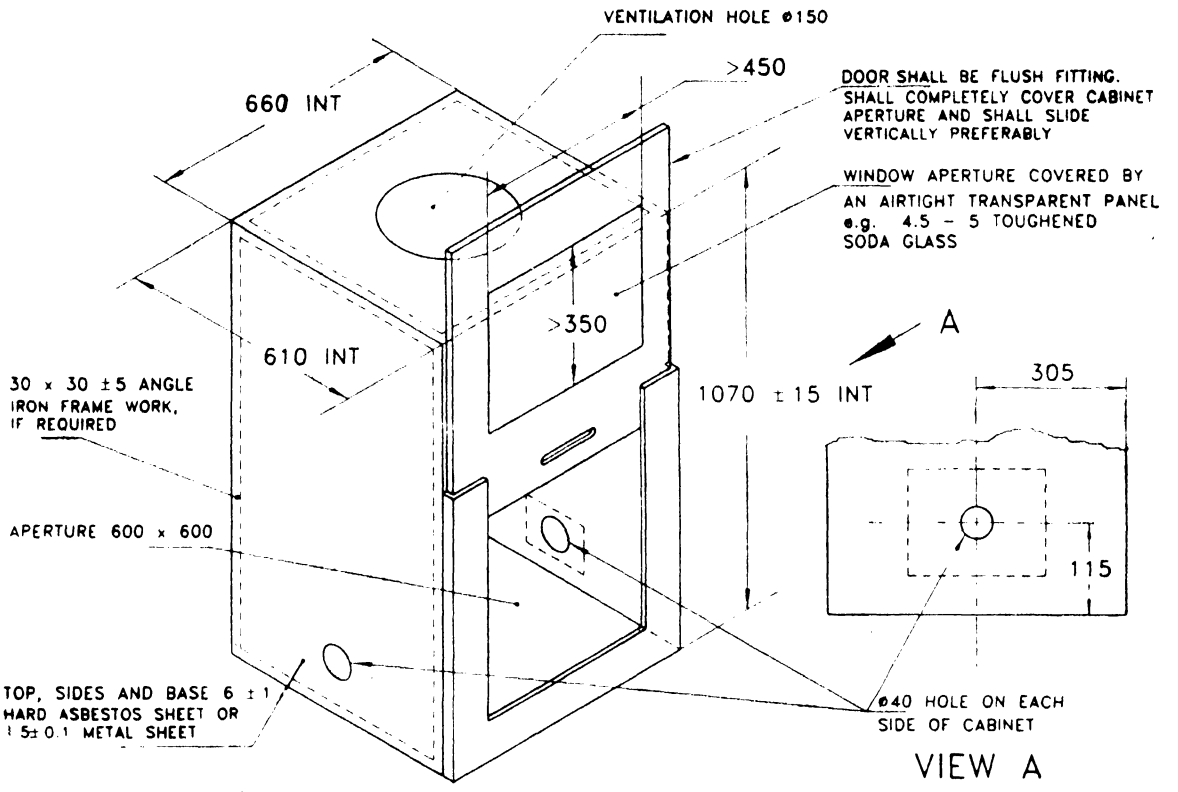
a) The time for all visible flame or glow to disappear on each of the six individual test pieces with covers intact.

The average time for all visible flame or glow to disappear on the six test pieces with covers intact.

b) The time for all visible flame or glow to disappear on each of the six individual test pieces with covers removed.

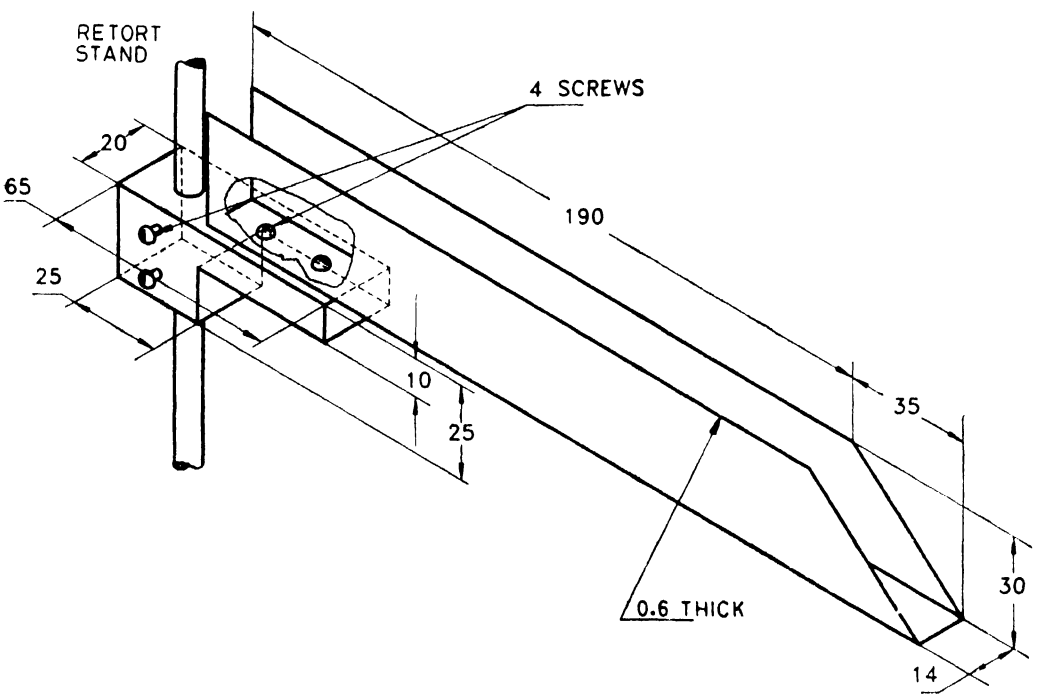
The average time for all visible flame or glow to disappear on the six test pieces with cover removed.

In the event that further samples are required to be tested as laid down in **15.2**, the results of these tests shall be reported additionally as in (a) or (b) above.



All dimensions in millimetres.

FIG. 17 CABINET FOR FLAME TEST



All dimensions in millimetres.

FIG. 18 TEST PIECE SUPPORT

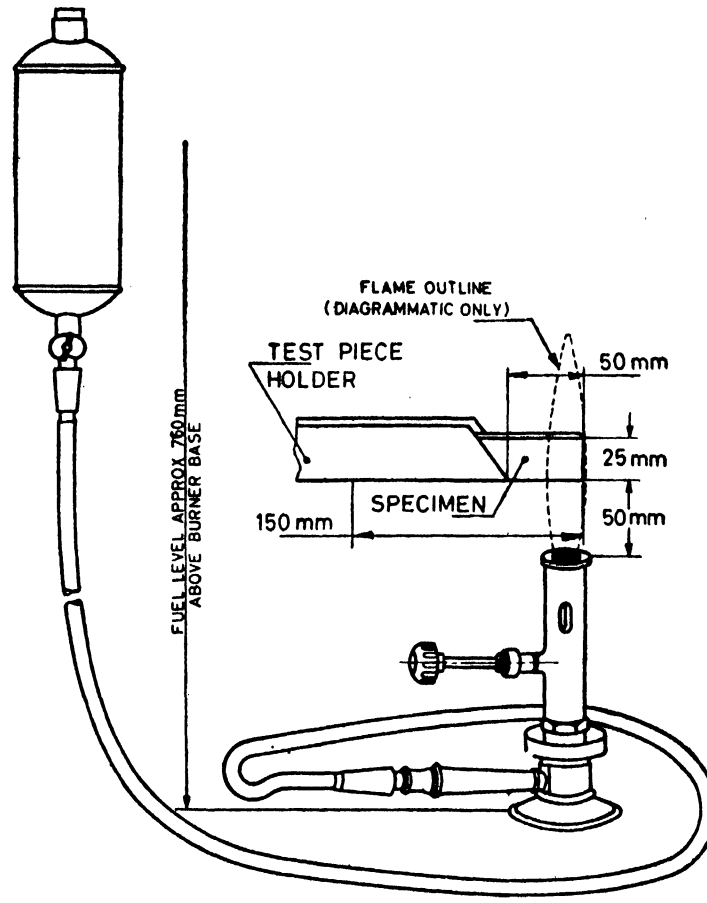


FIG. 19 LAYOUT OF SPIRIT BURNER FLAME TEST

ANNEX H

(*Clause* 15.3)

PROPANE BURNER TEST

H-1 APPARATUS

H-1.1 Gallery

The test shall be carried out in an experimental gallery of square section, 2 m × 2 m, through which air is drawn by a fan.

H-1.2 Trestle

The trestle shall be a framework of steel tubing having an external diameter 20-25 mm and is 2·20 m long × 1·25 m wide as shown in Fig. 20. The upper sides of the trestle frame shall be notched at 75 mm, 150 mm and multiples of 150 mm from the burner end of the frame in order to position and loosely retain fifteen 18/8 austenitic chrome/nickel rust, acid and heat resisting steel bars. The bars shall be 10 mm diameter × 1·4 m long, and form the frame on which the belt rests. The upper surface of the bars shall be 350 mm from the floor.

H-1.3 Burner

The burner, constructed in accordance with Fig. 21, shall consist of a 450 mm square frame having an overall height of 220 mm made of welded steel tubing having an external diameter of 20-25 mm. The tubing shall have 52 holes 1·5 ± 0·1 mm in diameter drilled at 50 mm intervals.

H-1.4 Fuel

The burner shall be fed with bottled propane gas of at least 95 percent and preferably 99 percent purity through a pressure reducing valve and a

length of high pressure hose having a minimum internal diameter of 6 mm. Before and during the test, the gas cylinder shall be immersed to approximately two-thirds of its height in a bath of water at a temperature of 25 ± 3°C. The gas cylinder shall not be emptied at the end of a test by more than 90 percent of its gas weight capacity. The weight of gas consumed during a ten minutes test period shall be 1·30 ± 0·05 kg.

This may be achieved by controlling the gas pressure at a standard orifice. A regulator is used to control the gas pressure at approximately 0·158 MPa when the orifice plate is 1·7 mm thick with a hole 2·5 mm in diameter, which is fitted into the 'handle' of the burner as shown in Fig. 21. A sensitive precision pressure gauge which has been calibrated to ensure that the correct weight of gas is consumed, is used to monitor the pressure in front of the orifice plate. Alternatively, the orifice plate and sensitive pressure gauge may be replaced by a flowmeter, calibrated to ensure that the correct weight of gas is consumed, inserted into the gas pipe line after the reducing valve.

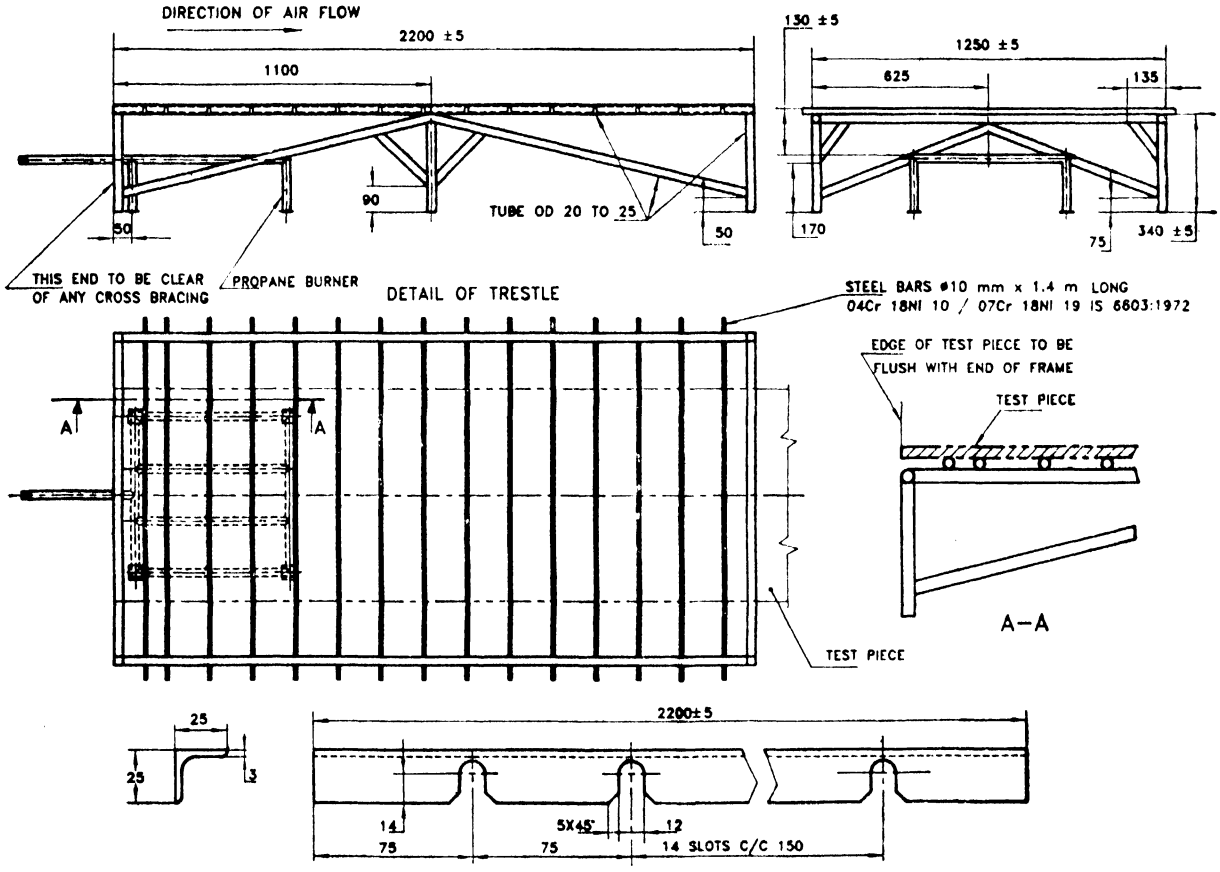
H-2 SAMPLING OF MATERIAL

The length of the sample of belting with top and bottom covers of equal specified thickness shall not be less than 4 m. For conveyor belting with top and bottom covers of unequal specified thickness the length of the sample be not less than 6 m.

The width of the samples shall be 900 mm for belt types 3, 4, 5 and 6. For belt types above these the sample width shall be 1 050 mm.

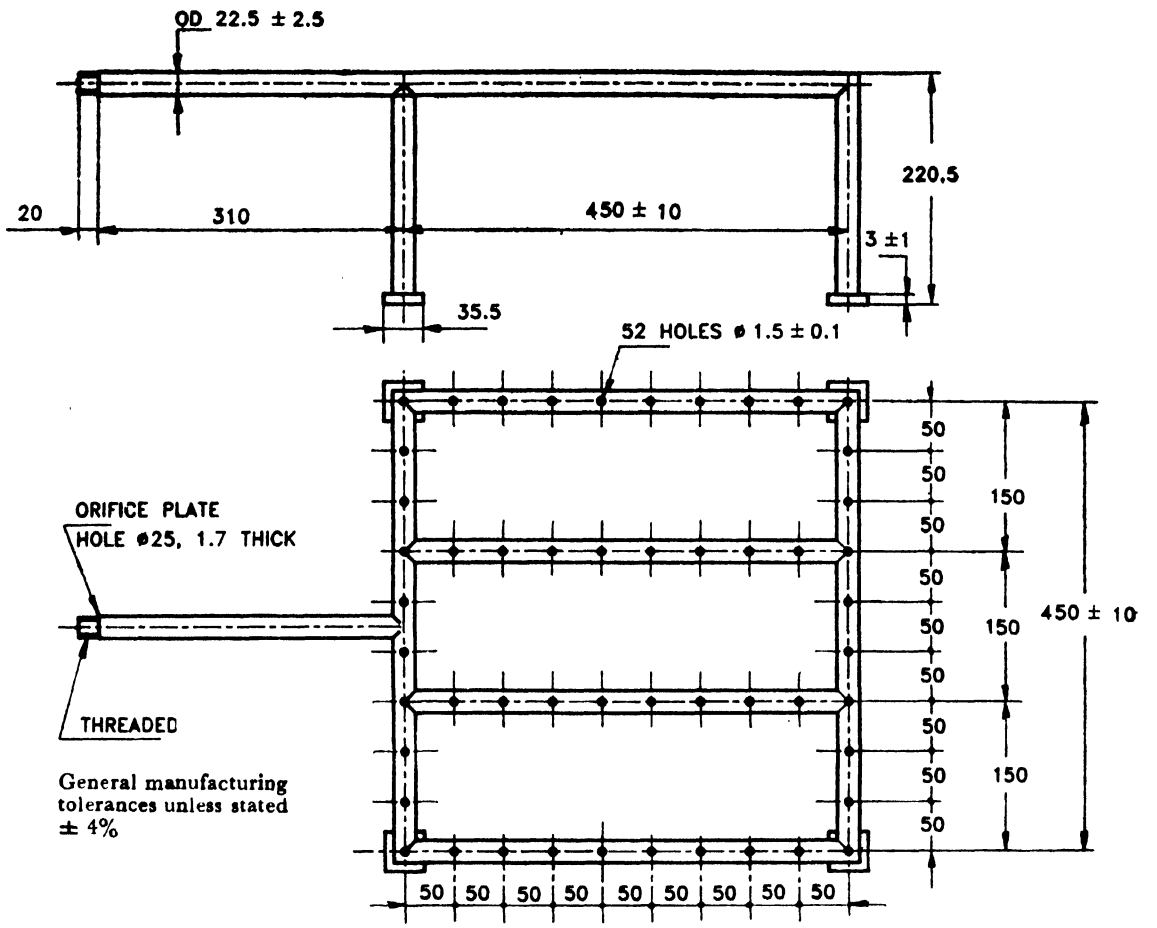
H-3 TEST PIECES

Full width rectangular test pieces each 2 m long shall be cut from the sample, two test pieces in the case of belting with covers of equal specified thickness, and three test pieces in the case of belting with covers of unequal specified thickness. The test pieces shall be laid out flat for 24 hours in dry conditions at any ambient temperature above 0°C immediately prior to testing to remove residual curvature.



All dimensions in millimetres.

FIG. 20 PROPANE BURNER TRESTLE SHOWING POSITIONS OF BURNER AND TEST PIECE



All dimensions in millimetres.

FIG. 21 PROPANE BURNER

H-4 TEST PROCEDURE

H-4.1 The trestle shall be installed centrally on the longitudinal axis of the gallery with the burner end facing the direction of the ventilation flow.

H-4.2 Each test piece in turn shall be placed centrally on the trestle with its transverse edge flush with the burner end of the trestle. In the case of belting with covers of unequal specified thickness, one test piece shall be tested with the thicker cover facing upwards one with the thicker cover facing downwards and a third to provide a retest of the worst condition found in the previous two tests. This procedure is necessary to ensure that the minimum two samples are tested in identical conditions.

H-4.3 The air current in the gallery shall be adjusted to give an average velocity of 1·5 ± 0·1 m/sec at a height of 350 mm. The measurement shall be taken on the centre line of the trestle and at a distance of 750 mm upward of it.

H-4.4 The burner shall be placed centrally with the four parallel burner tubes in line with the longitudinal axis of the piece, and positioned so that the distance from the top of the burner to the top of the bars on which the belt rests is 130 ± 5 mm, with the transverse end row of burner holes 50 mm inside the vertically projected transverse edge of the test piece.

H-4.5 The burner shall be lit and the rate of gas consumption immediately adjusted as defined in **H-1.4.**

At the end of 10 minutes the gas shall be switched off and the burner withdrawn from under the trestle. This prevents molten and charred material from falling on to the burner and blocking the holes.

H-4.6 The test piece shall be left on the trestle until all flame and glow have disappeared.

H-5 MEASUREMENT OF DAMAGE TO TEST PIECE

H-5.1 A measurement shall be made from the trailing edge on both the upper and lower surfaces

of the test piece of the length which remains undamaged, not blistered or charred, over its full width as shown in Fig. 22.

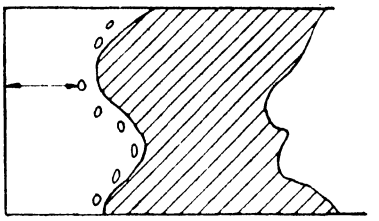


FIG. 22 MEASUREMENT OF DAMAGE TO TEST PIECE

The measurement in each case shall be made in a direction parallel to the longitudinal axis of the belt. If the edges of the test piece are not parallel because of uneven shrinkage, the direction of the longitudinal axis shall be judged by eye. The measurement shall be made along the surface of the test piece even if the test piece has become curved.

Care shall be taken to avoid confusing combustion damage with damage due to sooty or greasy deposits and it may be necessary to remove these locally with a dry cloth in order to inspect the surface of the belt for combustion damage. Heat may cause a shiny surface to become matt but this should not be regarded as combustion damage.

H-5.2 If failure of a test piece is due to its rolling up on itself towards the burner, the test shall be discontinued and a further test shall be carried out in which the rear end of the test piece is lightly wired to the trestle to restrain it from rolling up but shall not be so tightly bound as to prevent the small amount of a contraction which normally takes place when the test piece is heated by the propane burner.

The criteria for assessing damage to belting are listed below:

a) Damage shall include any embrittlement, hardening, cracking, blistering and other blemishes not originally present.

b) Small blemishes, defined as blisters or other damage having no dimension greater than 5 mm, shall be dealt with as follows:

   i) In making the measurement of belting left undamaged, up to 5 small blemishes nearest the trailing edge of the belting sample, can be regarded as not being damaged.

   ii) Small blemishes more than 50 mm from each other and from any other damage shall also not be regarded as damage and shall be ignored.

   iii) Any further small blemishes shall be formed into groups occupying regions of the belt surface which can be enclosed within circles of up to 50 mm diameter. The size and arrangement of these regions shall be chosen in such a way as to produce the most favourable test result. Any one such region shall not be regarded as changed and shall be ignored. Any additional regions shall not be regarded as damaged and shall be ignored provided that such regions are separated by at least 300 mm of undamaged belt surface.

H-6 EXPRESSION OF RESULTS

The two measurements made on each test piece of the length which remains undamaged over its full width on the upper and lower surfaces measured in accordance with **H-5**, shall be recorded. The lower of the two measurements made on each test piece defines the length of full width belting remaining undamaged.

The time for all flame or glow to disappear shall be recorded.

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Doc : No. LM 09 (4687)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at New India Printing Press, Khurja, India